

WHAT IS CLAIMED IS:

1. A method for reducing system deterioration caused by polarization effects when an optical signal is transmitted to a destination using an optical transmission system having an optical path comprised of fast and slow polarization axes, comprising the steps of:

a) controlling a transmission end to divide the optical signal into two polarization components orthogonal to each other within one bit before transmitting the optical signal so that a PMD (Polarization Mode Dispersion) can be compensated in the optical path; and

b) applying one polarization component of the two orthogonal polarization components to the fast polarization axis of the optical path, applying the other polarization component of the two orthogonal polarization components to the slow polarization axis of the optical path, and reducing the influence of the PMD using a predetermined effect indicative of a pulse width reduction caused by the PMD.

2. The method as set forth in claim 1, wherein the step (a) includes the steps of:

a1) controlling a first intensity modulator driven by a data signal to modulate an output signal of a light source into an NRZ (Non Return to Zero) signal;

a2) controlling a second intensity modulator driven by a clock frequency signal synchronized with the data signal to modulate the NRZ signal into an RZ (Return to Zero) signal; and

a3) applying the RZ signal to a component inducing a DGD
5 (Differential Group Delay) corresponding to 30~70% of a period of the data signal at an angle of 45° with respect to a reference polarization axis so that only one polarization component is delayed by 30~70% of the data signal's period.

10 3. The method as set forth in claim 2, wherein the component inducing the DGD at the step (a3) is indicative of a PMF (Polarization Maintaining Fiber).

15 4. The method as set forth in claim 1, wherein the step (a) includes the steps of:

a1) controlling an intensity modulator driven by a data signal to modulate an output signal of a light source into an NRZ (Non Return to Zero) signal; and

20 a2) controlling a polarization modulator driven by a clock frequency signal synchronized with the data signal to return the NRZ signal to a signal polarized by a predetermined ratio 30~70% within one bit,

25 whereby the output optical signal of the transmission end can simultaneously contain two polarization components within one bit.

5. The method as set forth in claim 1, wherein the step
(a) includes the step of:

performing a signal modulation process, such that one
5 sub-polarization component contained in two orthogonal
polarization components (each composed of two sub-polarization
components) between nearby bits has the same phase as the other
sub-polarization component, and a remaining sub-polarization
component contained in the two orthogonal polarization
10 components between nearby bits has a phase opposite to that of
a counterpart sub-polarization component of the remaining sub-
polarization component.

6. The method as set forth in claim 5, wherein the step
15 (a) includes the steps of:

a1) controlling a first intensity modulator driven by a
data signal to modulate an output signal of a light source into
an NRZ (Non Return to Zero) signal;

20 a2) controlling a second intensity modulator driven by a
clock frequency signal synchronized with the data signal to
modulate the NRZ signal into an RZ (Return to Zero) signal;

a3) controlling a polarization modulator driven by a
square or sinusoidal wave corresponding to a half the clock
frequency signal to change a polarization direction at
25 intervals of one bit so that individual nearby bits of the RZ

signal have polarization states orthogonal to each other; and

a4) applying individual bits of the RZ signal being polarization-modulated for every bit generated at the step (a3) to a component inducing a DGD (Differential Group Delay) corresponding to 30~70% of a period of the data signal at an angle of 45° with respect to a reference polarization axis, dividing each bit into two polarization components, and delaying only one polarization component of the two polarization components by 30~70% of the data signal period,

whereby the two polarization components are simultaneously contained in just one bit, one of the two polarization components has the same phase as that of a nearby bit, and the other one has a phase opposite to that of the nearby bit.

7. An apparatus for reducing system deterioration caused by polarization effects, comprising:

a transmission end,

said transmission end including:

a light source;

a first intensity modulator driven by a data signal, for modulating an output signal of the light source into an NRZ (Non Return to Zero) signal;

a second intensity modulator driven by a clock frequency signal synchronized with the data signal, for

modulating the NRZ signal received from the first intensity modulator into an RZ (Return to Zero) signal;

a polarization modulator driven by a signal having a frequency equal to a half a frequency of the clock frequency signal, for modulating the RZ signal received from the second intensity modulator into another signal so that individual nearby bits have polarization components orthogonal to each other;

a PMF (Polarization Maintaining Fiber) for controlling a polarization direction of the polarization-modulated signal to be equal to an angle of 45° on the basis of its own polarization axis, and generating a difference between group velocities of two orthogonal polarization components; and

a transmission end polarization controller positioned between the polarization modulator and the PMF, for controlling the polarization direction of the polarization-modulated signal.

8. An apparatus for reducing system deterioration caused by polarization effects, comprising:

a transmission end,

said transmission end including:

a light source;

a first intensity modulator driven by a data signal,

for modulating an output signal of the light source into an NRZ (Non Return to Zero) signal;

5 a second intensity modulator driven by a clock frequency signal synchronized with the data signal, for modulating the NRZ signal received from the first intensity modulator into an RZ (Return to Zero) signal;

10 a PMF (Polarization Maintaining Fiber) for controlling a polarization direction of the polarization-modulated signal to be equal to an angle of 45° on the basis of its own polarization axis, and generating a difference between group velocities of two orthogonal polarization components; and

15 a transmission end polarization controller positioned between the second intensity modulator and the PMF, for controlling a polarization direction of the modulated RZ signal.